REMARKS/ARGUMENTS

Favorable reconsideration of the present application is respectfully requested.

Claims 1, 8 and 14 have been amended to further recite that the fuel cell is one which has been used for an extended period of time. Basis for this is found in paragraph [0006]. New Claims 40-41 correspond to rejected Claims 1 and 8 but further recite that the predetermined basic output characteristic is a function of an internal resistance of the fuel cell. Basis for this is found in equations 1 and 2. That is, a basic output characteristic may be calculated at step S104 (Figure 2), wherein a basic output characteristic V1 can be obtained based upon a theoretical output characteristic V0 and a basic internal resistance R0 (see equation 1). Subsequently, an output of the fuel cell (e.g., V2) can be estimated on the basis of the basic output characteristic (equation 2).

Consistent with the prior Notice of Allowability, Applicants respectfully submit that the withdrawn Claims 14-17 should be included in any patent issuing from the present application. Accordingly, new Claim 42 corresponds to Claim 14 but further recites that the predetermined basic output characteristic is a function of an internal resistance of the fuel cell.

Claims 1-3, 7-9 and 11-13 were rejected under 35 U.S.C. 102 as being anticipated by the newly cited U.S. patent 5,290,641 (Hirashima). However it is respectfully submitted that the amended claims clearly define over this reference.

The rejected claims 1-3, 7-9 and 11-13 now recite a fuel cell system, or a fuel cell output characteristic estimating apparatus, for estimating an output characteristic of a fuel cell "which has been used for an extended period of time." The power output characteristic of a fuel cell changes over time (paragraph [0004]) as a result of changes in the fuel cell due to extended use, even if the load demand is unchanged. Thus a fuel cell which has been used for an extended period of time is structurally changed and its output may not be sufficient for

even a steady state load. The claimed invention therefore provides fuel cell output characteristic estimating apparatus for estimating an output characteristic of a fuel cell which has been used for an extended period of time, which includes a controller that estimates the output characteristic of the fuel cell on the basis of the detected output current and the detected voltage between the terminals, detected by a current-voltage detector, and a predetermined basic output characteristic of the fuel cell.

In contrast, Hirashima is concerned with the possibility of an overload of the fuel cell between the time that a load increase is commanded and a time that the fuel cell temperature reaches a stable value (col. 2, lines 18-31). Hirashima therefore adds an extra amount "q" to the reference fuel flow rate (Fig. 4) to compensate for the voltage drop due to a low fuel cell temperature until the fuel cell temperature has reached a steady state operating temperature (col. 7, lines 8-39). Thus Hirashima is concerned only with changes to the output characteristic for *transient* load changes. It provides no teaching for estimating the output characteristic of a fuel cell which has been structurally changed due to extended use. Amended Claims 1-3, 7-9 and 11-13 therefore define over this reference.

Hirashima further describes that the fuel cell is controlled by current value control in steady state conditions, wherein the fuel gas supply is determined by the output current value (col. 6, lines 19-24). Upon the receipt of an increased load demand, a reference current at a given temperature corresponding to the load demand is calculated based on the graph of Fig. 5 (col. 6, lines 25-34), which then determines a reference fuel flow rate Q. However, since the actual fuel cell temperature is less than that for the calculated reference flow rate, the extra amount "q" is added to the reference fuel flow rate Q until the fuel cell temperature reaches the reference level (col. 7, lines 9-56).

The outstanding rejection states that the aforementioned portion of Hirashima discloses estimating the output characteristic of the fuel cell using factors including a basic output characteristic. However, as is evident from the aforementioned explanation, Hirashima only teaches adjusting the fuel flow rate such that the actual fuel cell output corresponds to the calculated reference output required for an increased load. There is no description that output characteristic of the fuel cell which has been used for an extended period of time is determined on the basis of the detected output current and the detected voltage between the terminals, and a predetermined basic output characteristic of the fuel cell.

Claim 3 additionally recites that the controller derives the basic output characteristic from an output characteristic of the fuel cell corresponding to factors including an internal resistance of the fuel cell. Similarly, new Claims 40-42 recite that the predetermined basic output characteristic is a function of an internal resistance of the fuel cell. The rejection of Claim 3 does not specify the manner in which Hirashima discloses a controller that derives a basic output characteristic from an internal resistance of the fuel cell, however the rejection of paragraph 4 indicates that the Examiner considers this to be inherent in Hirashima because "the internal resistance and current are inversely proportional to each other, so the estimation of the current would be inversely proportional to the [internal] resistance." However it is respectfully submitted that this is incorrect. The "current" mentioned above evidently refers to the output current of the fuel cell as shown in Fig. 4, but this output current is not the simple inverse of the internal resistance of the fuel cell. Instead, as is evident from Fig. 4 of Hirashima, the output current of the fuel cell is the product of a number of factors including the fuel flow rate and the fuel cell temperature. Therefore the calculation of a reference output current does not inherently calculate a fuel cell internal resistance, and the calculation of a reference output current in Hirashima is not evidence of estimating the output

characteristic of a fuel cell on the basis of a predetermined basic output characteristic which is a function of an internal resistance of the fuel cell.

Claims 4-6 and 10 were rejected under 35 U.S.C. 102 or 35 U.S.C. 103 as being anticipated by, or obvious over, Hirashima. This is also traversed. Claims 4-6 further recite that the controller estimates an internal resistance of the fuel cell. However, as discussed above, Hirashima does not explicitly discuss the internal resistance of the fuel cell, and this is not inherent from the calculation of a reference output current.

As for Claim 10, this claim recites a transformer connected to terminals of the power supply. In contrast the Examiner has relied on a description in Hirashima of inverting the output *of the fuel cell*. For this reason and because Hirashima fails to teach determining an output characteristic of a fuel cell which has been used for an extended period of time on the basis of a predetermined basic output characteristic of the fuel cell, Claim 10 is neither anticipated nor rendered obvious by Hirashima.

Applicants therefore believe that the present application is in a condition for allowance and respectfully solicit an early notice of allowability.

Respectfully submitted,

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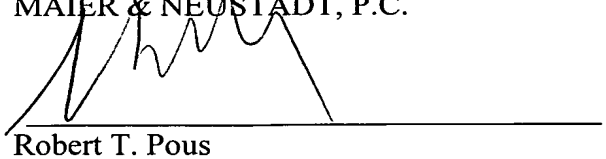

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